

Substitutional Doping of Mn in III-V Diluted Magnetic Semiconductor GaN Studied by XAFS Methods

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Extended x-ray absorption fine structure (EXAFS) and near-edge x-ray absorption fine structure (NEXAFS) techniques have been employed to investigate the local structure and valency about Mn atoms in Mn-doped III-V compound semiconductor GaN. This diluted magnetic semiconductor has been theoretically predicted to be ferromagnetic at room temperature thus stimulated tremendous interest in possible "spintronics" applications. Samples grown at different temperatures were prepared by MBE. Heat treatment was also applied to samples grown at lower temperatures. Our EXAFS results indicate that Mn dopant atoms substitute for Ga sites in all the GaN:Mn samples investigated. The effective valency of Mn as estimated by NEXAFS was found to be close to but less than 2+ for all the samples.

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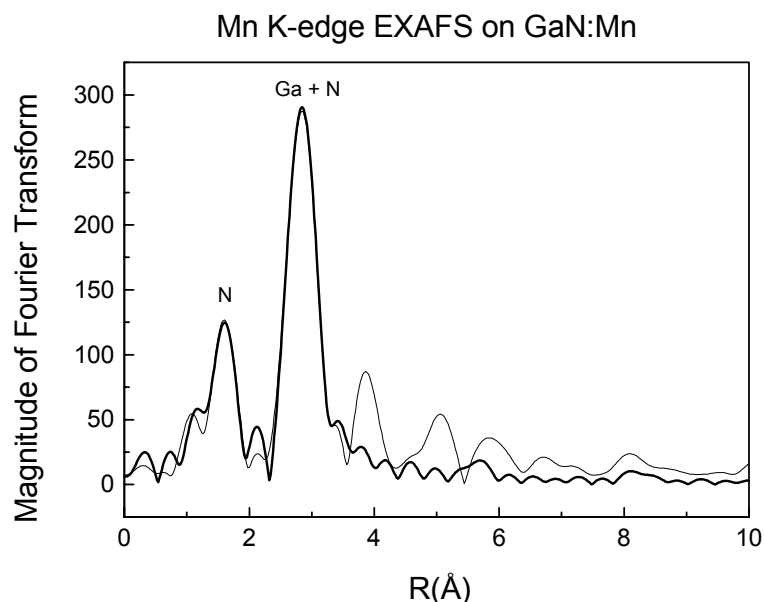


Figure 1. Fourier transform of EXAFS χ functions. Fine line: experimental; coarse line: curve-fitting